Announcements

- Homework for tomorrow…

(Ch. 26, CQ 7 & 8, Probs. 12 & 14)

CQ2a): 

b): 

26.4: E = 7.6 x 10^3 N/C, 90^0 below the horizontal

26.6: a) q = 2.0 x 10^{-9} C b) E = 180 N/C

Office hours…

MW 10-11 am

TR 9-10 am

F 12-1 pm

- Tutorial Learning Center (TLC) hours:

MTWR 8-6 pm

F 8-11 am, 2-5 pm

Su 1-5 pm

Chapter 26

The Electric Field

(*The E-Fields of Rings, Disks, & Planes*)

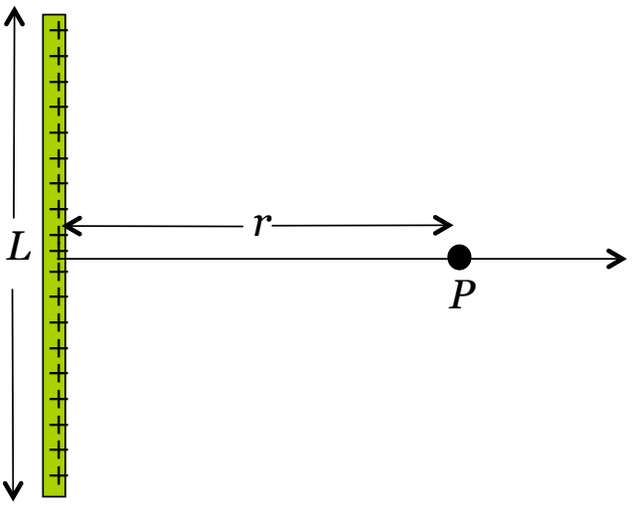
Last time…

- *Linear & surface charge densities*

$$\lambda = \frac{Q}{L} \qquad \eta = \frac{Q}{A}$$

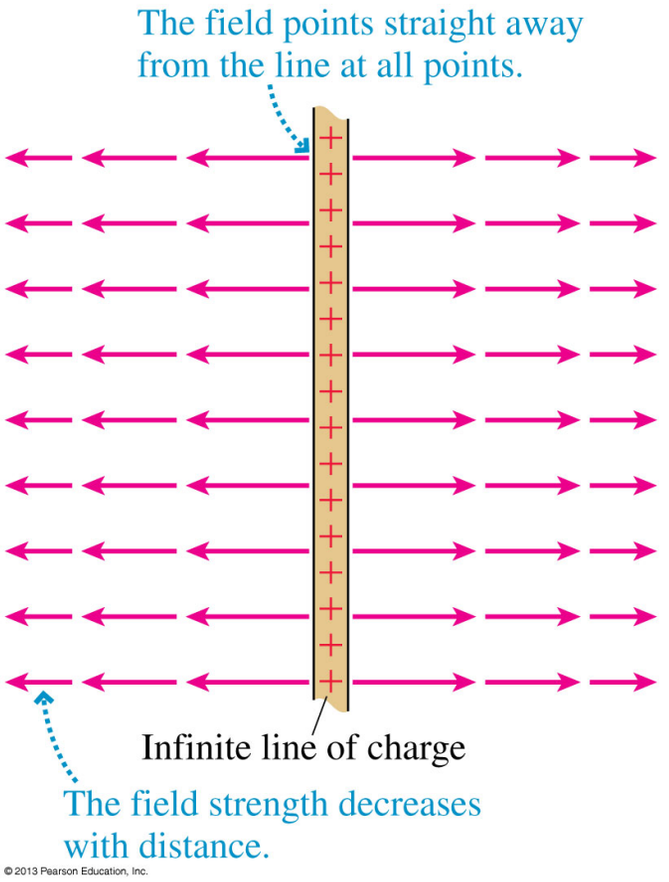
- *E-field* of a *rod* of length L & charge Q in the *bisecting plane*..

$$E_{rod} = \frac{1}{4\pi\epsilon_0} \frac{Q}{r\sqrt{r^2 + L^2/4}}$$



- Q: What if we get *really far away*?
- Q: What if the rod becomes *infinitely* long?

E-field of a line of an infinite line charge..

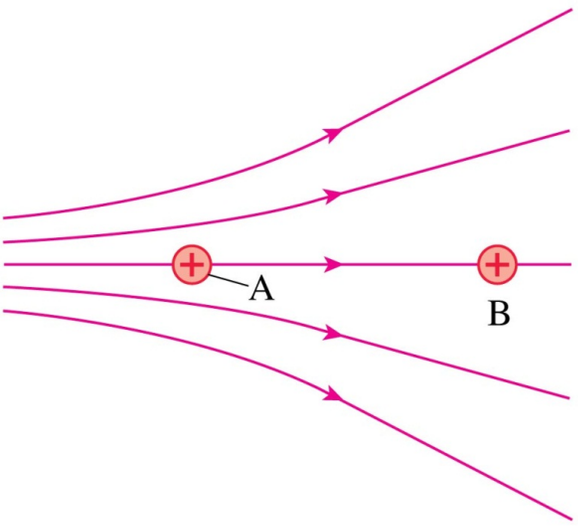


$$E_{line} = \frac{1}{4\pi\epsilon_0}\frac{2\lambda}{r}$$

Quiz Question 1

Two protons, *A* and *B*, are in an *E*-field.

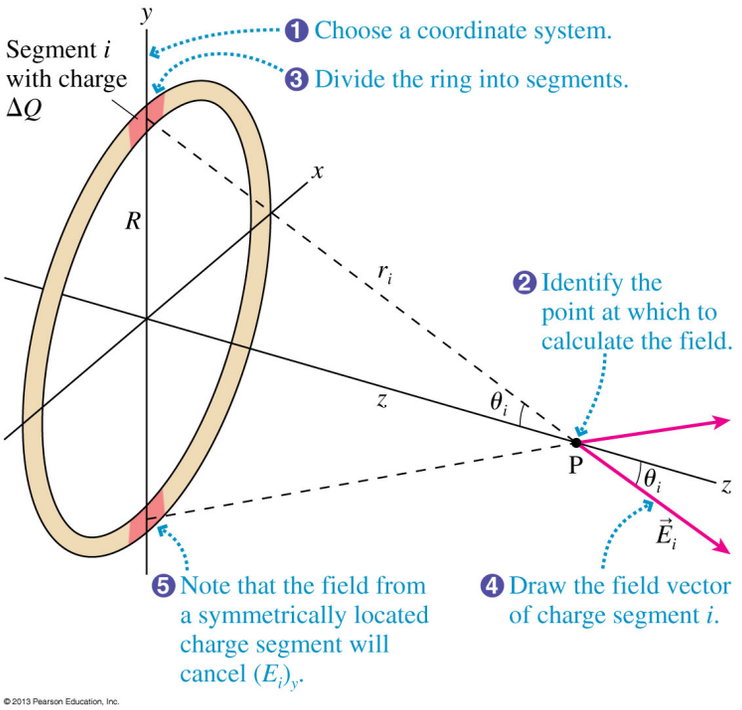
Which proton has the larger acceleration?



1. Proton *A*
2. Proton *B*
3. Both protons have the same acceleration

i.e. 26.4
E-field of a ring of charge..

A thin ring of radius R is uniformly charged with total charge Q. Find the E-field at a point on the axis of the ring.



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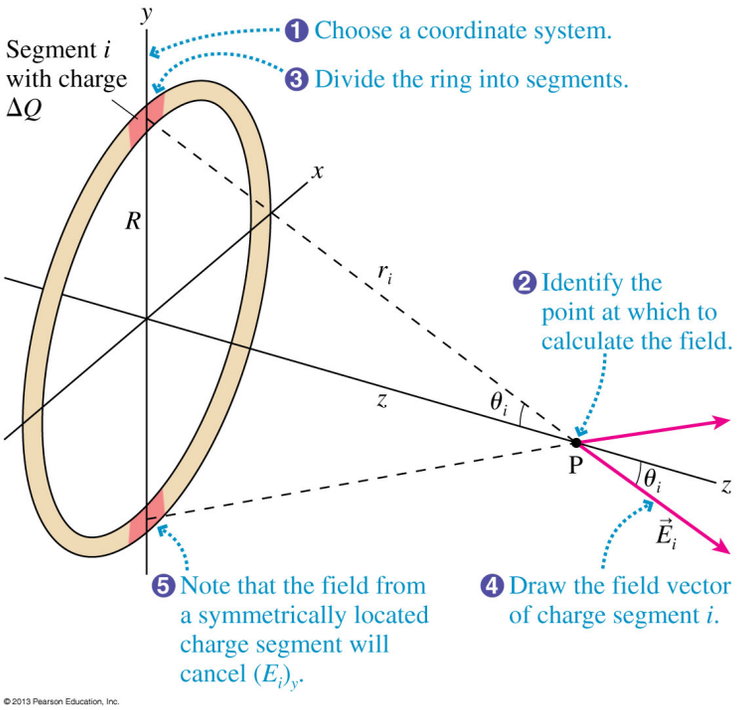


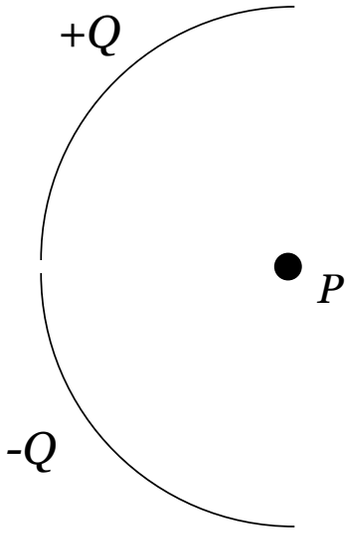
$$\vec{E}_{Ring} = \frac{1}{4\pi\epsilon_0}\frac{Qz}{(z^2+R^2)^{3/2}}\hat{k}$$

- Q: What about for $-z$?
- Q: What about for $-Q$?

Quiz Question 2

Positive charge, $+Q$, is uniformly distributed on the upper half of a semicircular rod and negative charge, $-Q$, is uniformly distributed on the lower half.

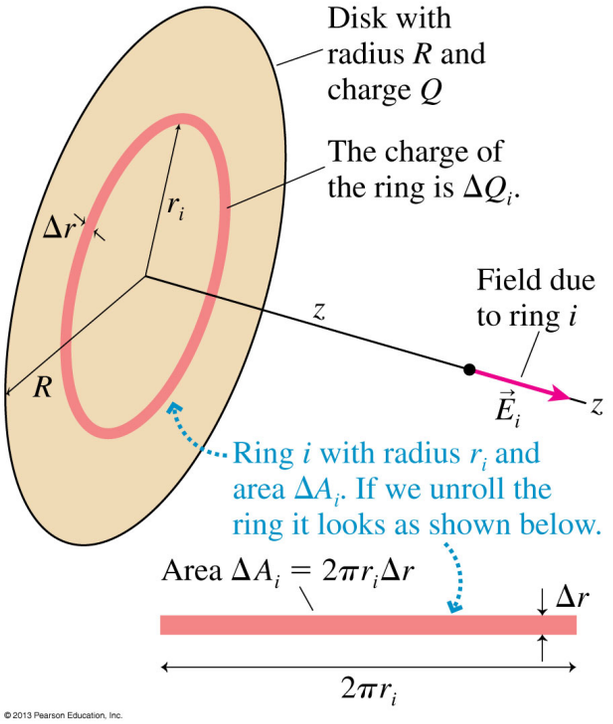
What is the direction of the electric field at point *P*, the center of the semicircle?



1. Up.
2. Down.
3. Left.
4. Right.
5. Down and to the left.

E-field of a disk of charge..

A disk of radius R is uniformly charged with total charge Q. Find the E-field at a point on the axis of the disk.



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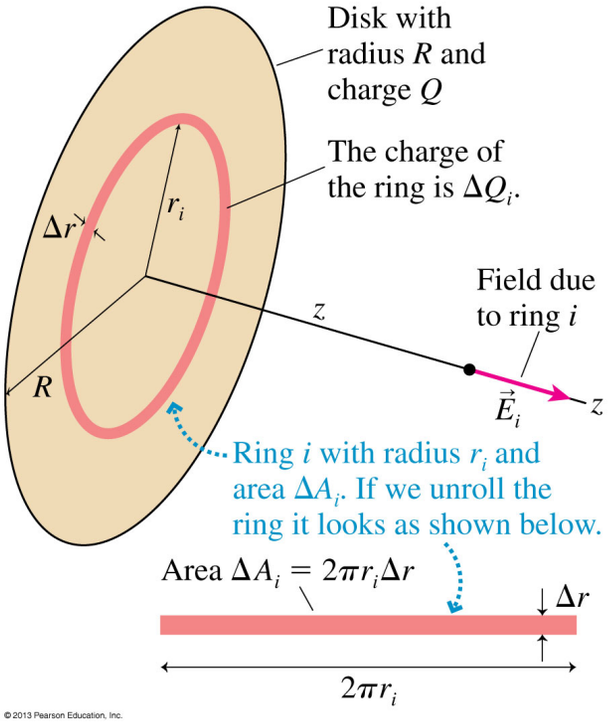
A disk of radius R is uniformly charged with total charge Q. Find the E-field at a point on the axis of the disk.



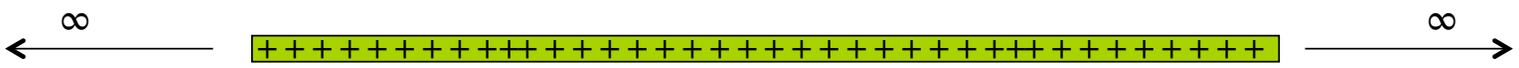
$$\vec{E}_{disk} = \frac{\eta}{2\epsilon_0}\left[1 - \frac{z}{\sqrt{z^2 + R^2}}\right]\hat{k}$$

Notice:

- For $z<0$, *same magnitude* but *opposite direction*

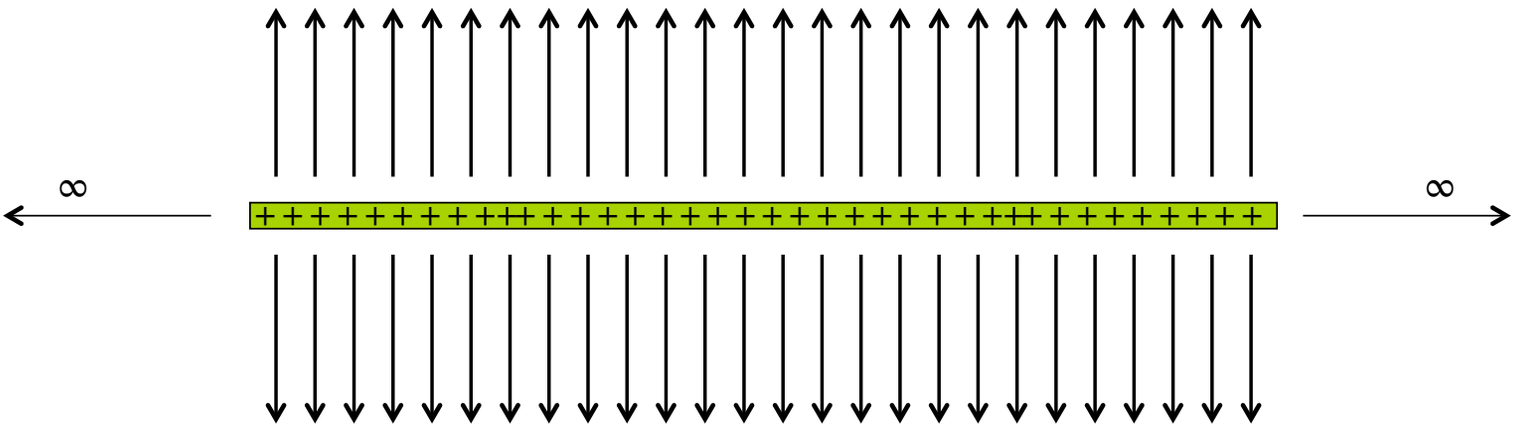
E-field of a plane of charge..

A plane is uniformly charged with uniform surface charge density η. Find the E-field...



E-field of a plane of charge..

A plane is uniformly charged with uniform surface charge density η. Find the *E*-field…



$$E_{plane} = \frac{\eta}{2\epsilon_0}$$

Notice:

- A *constant*!
- Zero height dependence?